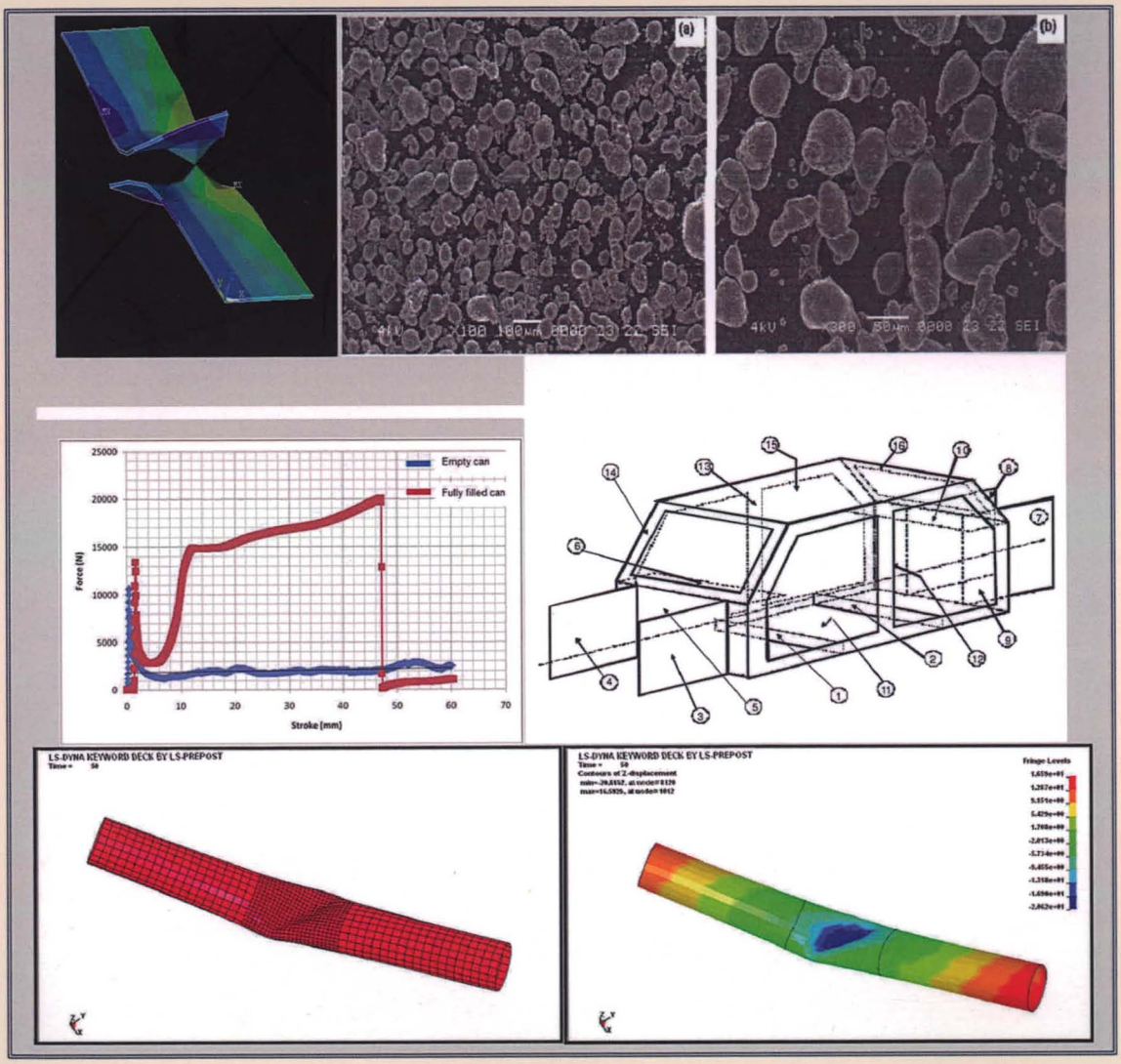
ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS



Edited by

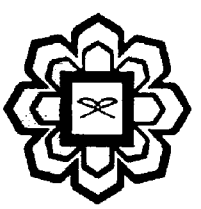
Meftah Hrairi

IIUM PRESS
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

ADVANCED TOPICS IN MECHANICAL BEHAVIOR OF MATERIALS

Edited by

Meftah Hrairi



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

ISBN: 978- 967-418-174-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN. BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan

Contents

Section 3 Design and Manufacturing

Section 4 Liquid Sloshing

9

BUCKLING AND CRUSH ANALYSIS OF LIGHT WEIGHT STRUCTURE

Kassim A. Abdullah and Wan Nur Hidayah Wan Sulaiman

1. INTRODUCTION

Buckling and crushing analysis has been widely performed by many researchers all over the world [1-3]. One of the reasons is because crushing behavior has capabilities of higher energy absorption and maximum load carrying capacity. However, these properties are affected by many factors, such as; material type, cross section, geometry, thickness, length, weight etc.

Various modes of plastic deformation such as flattening, splitting, tube inversion and folding are crucial criteria in determining the energy absorption of a material. Somehow, the prediction of the deforming behaviors is difficult. The exact behavior of the collapse is a very complex process due to its dependency on many process parameters. Some of the process parameters are diameter-to-thickness ratio, length-to-thickness ratio, length-to-width ratio, friction between the platen-tube interfaces, and stiffness-to-weight ratio.

In terms of geometry factors, square tubular structures are among the energy absorbing devices which can be used in many applications such as cars, ships, aircrafts, and so on. The advantage of the tubular is that it has simple geometry, low cost and high energy absorbing capability. Studies of crashworthiness have attracted much attention in recent years particularly in analyzing the deformation characteristics and determining the energy absorbing efficiency of various thin wall crashworthy components of different materials